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Title:An ion-charged carbon nanotube oscillator beyond the terahertz regime
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Abstract:A frequency-tunable nano-oscillator consisting of a K⁺ ion and a negatively-charged carbon nanotube (CNT) was proposed. The ion induces a strong dielectric response on the wall of the CNT, which can be described through a self-consistent classical molecular dynamics based on the atomistic moment method. The calculation results indicate that the stability and the oscillating frequency of the oscillator strongly depend on the quantity of charge on the CNT. As the extra charge on the CNT increases, the oscillator becomes more stable, and the oscillating frequency increases successively, from 0.23 to 1.31 THz. The high frequency and stability of the system are due to the strong axial Coulomb restoring force and its small fluctuations in the cross section of the CNT. This kind of nano-oscillator can be used as a frequency-tunable terahertz wave detector.
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